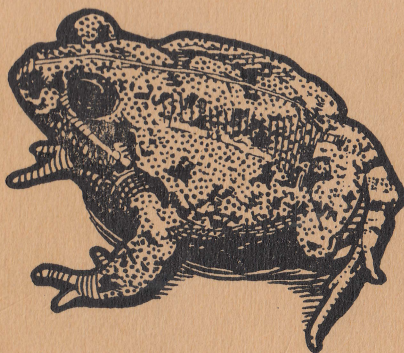


FROGS & TOADS

OF SOUTH AFRICA

By WALTER ROSE



Fully Illustrated

By the Author of "Lizards of South Africa,"
"South African Snakes," "Veld and Vlei," etc.

THE SPECIALTY PRESS OF SOUTH AFRICA LTD.
CAPE TOWN : : : : WYNBERG

1929

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*This Book forms part of the complete Volume "VELD
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Snakes, and Tortoises of South Africa, with Chapters on
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CHAPTER I.

REPTILES AND BATRACHIANS.

The animal kingdom is divided into two main subdivisions, the *Vertebrata* or animals that possess a vertebral column or "backbone, and *Invertebrata* or animals that have no "backbone."

The *Vertebrata* are subdivided into five main groups, namely:—

1. Fishes.
2. Batrachians.
3. Reptiles.
4. Birds.
5. Mammals.

It is with the second and third of these groups only that we concern ourselves in these pages.

Excluding a single rare New Zealand species, Reptiles are divided into four orders:—

1. *Chelonia* (Tortoises, etc.).
2. *Crocodylia* (Crocodiles, etc.).
3. *Lacertilia* (Lizards).
4. *Ophidia* (Snakes).

The second we shall not touch upon at all, and the first somewhat briefly; the third and fourth we shall deal with in some detail in their respective sections.

Batrachians are divided into three main orders, namely:—

1. The *Anura* or Tailless Batrachians.
2. The *Urodela* or Tailed Batrachians.
3. The *Apoda* or Limbless Batrachians.

It is only with the first of these orders that we have to deal, as neither of the others is represented in South Africa.

The Tailless Batrachians, that is to say the Frog and Toad Order, is a fairly large one containing about 1,200 species. About 70 of these are found in South Africa and in the Cape Peninsula just 19, exactly the same number—but of course not the same species—as are found in the whole of Europe.

The Peninsula Batrachia may be considered fairly to epitomise the subcontinental types; all the five South

African families being represented. Each of these families is divided into genera, and each genus is further divided in species.

(The scientific name of any animal is made up of the name of the genus to which it belongs, the generic name, followed by the name of the species, the specific name.)

We do not intend to say much about the general characteristics of batrachians as those interested will find the subject treated fully and more authoritatively in many other books, but a few main points may be noted.

The skin of all tailless batrachia is quite naked and studded with more or less conspicuous glands. These are capable of secreting an acrid fluid of a nauseous and even poisonous character. Indeed, so poisonous is the secretion of one species that it is utilised by certain Central American Indian tribes to poison their arrows.

An amusing and more peaceful use of the secretion of this tree frog, well worthy of a higher civilisation, is related.

Having secured a common green parrot, the simple savage plucks the feathers from its head and neck and then rubs the bare places with a luckless tree-frog. The secretion of the frog has the effect of causing the new feathers to grow yellow instead of green; the fantastic outcome being sold to unsuspecting tourists as a "rara avis."

In Central America this little frog might well be regarded as "the gintlemin that pays the rint."

In the case of toads the skin glands appear as conspicuous warts, many species having extra large patches of glands, known as the parotoid glands, situated behind the eyes.

These glands give a more copious flow of secretion than those on the rest of the body, in fact one large South American toad is said to be able to discharge the fluid to a considerable distance.

Whatever may be the case with these foreigners, one is safe in saying that no South African species has any power of causing harm to human beings, the only function served by their secretion being to make them nauseous to certain animals that might seek to devour them.

This protection, however, does not serve them against snakes, in fact many of these have adopted toads as their main diet.

We have found the secretion of a small local frog *Cacosternum capense* (see CHAPTER NINE) to be unex-

pectedly deadly to other batrachians. On one occasion a Grass Frog and a dozen Micro Frogs; and on another, 19 out of 25 small toads, placed in the same vivarium therewith, were found dead within a few hours.

All of our tailless batrachians lay eggs, for the most part in water in which the first part of the animal's life, its tadpolehood, is passed. On completing the metamorphosis most frogs and toads leave the water, only revisiting it at breeding time: but some species remain more or less aquatic throughout their lives.

The number of the eggs varies greatly from the 20 or so of the Chirping Frog to the 25,000 of the Leopard Toad, and the site and manner of deposition are also subject to interesting variations.

These and other points are touched upon in the following pages, whilst the habits of our local types are further summarised in the Appendix. Here also we give a table showing how our local paddas are grouped.

It is true that the plathander has not claws on any of his eight fingers, nor even on all his ten toes; the inner three on each foot being the only ones thus armed; but these six, being six more than the next best, amply justify his generic name, *Xenopus*; which is derived from two Greek words meaning "strange foot." The specific name is "*laevis*" meaning smooth, and anyone who has tried to hold an active specimen will grant that this name would for suitability be excelled only by "*laevisissimus*."

However, it is not only on the score of having claws that *Xenopus* is worthy of special attention. He belongs to the sub-order "*Aglossa*" or Tongueless Frogs, which comprises only three genera, viz.: *Xenopus* of South and



Fig. 2. Common Plathander (*Xenopus laevis*).

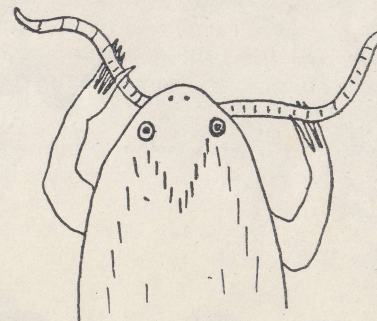
Tropical Africa, *Hymenochirus* of Tropical Africa, and *Pipa* of Tropical America. This last is the famous Surinam frog, whose extremely curious breeding habit has frequently been described. *Hymenochirus* resembles *Xenopus* in having claws, but differs in having the fingers as well as the toes webbed, and in having no teeth.

It is not generally known that most frogs have teeth; which, though usually tiny, are firmly set in the upper, and more rarely, in the lower jaw, and are a very useful guide to the scientist in classifying the numerous genera and species.

Perhaps the most noticeable feature about the plathander is his essentially aquatic character; the pointed head, upturned eye, tapering body, powerful hind limbs

and broadly webbed feet, all contributing to fit him perfectly for a life in the water. Most of these characteristics are well portrayed in Fig. 1, which is an X-Ray of a medium-sized specimen. On land he is slow and awkward, moving by a succession of ungainly flops, the character of the limbs preventing him from sitting up (Fig. 2). Put him in water, however, and note his speed and agility. Up and down, to and fro, he darts, twisting and turning as readily as a fish.

If you wish him to show off his full repertoire of accomplishments, however, you must feed him. Get a small garden worm and drop it in front of him. A sudden movement and the worm has vanished. But how? Get a larger one and watch.



Most frogs have long, sticky tongues, attached to the front of the floor of the mouth, by the rapid projection of which they are enabled to secure their prey. *Xenopus* being tongueless cannot do this, and indeed appears to be quite incapable of feeding when on land.

But watch him with his large worm. You will have noticed his long sharp fork-like fingers, and it is as forks that he uses them now. A jerk brings them together, holding the worm, the while he seizes it by the middle with his mouth. A few pokes with his forks, and another worm has disappeared for ever.

Try a few tadpoles for a change; the forking action, though hardly necessary this time, is again performed. "Thanks! Anything else to-day?" he seems to say, looking as if he would like to wink. He probably would do so were it not for the fact that he has no eyelids; unless one counts as an eyelid a transparent membrane that covers the eye when under water. "A small frog? Why not? What's that? I've just eaten a young plathander?"

I don't care. I often do it." And *Xenopus* careers gaily up and down his tank after his act of infanticide, with a conscience as untroubled as that of a wireless pirate (Fig. 3).

In fact the Plathander will eat anything living, of a size that he can encompass, and fresh water crustacea, small fish, aquatic insects and larvae, all contribute to his bill of fare. In captivity he can be induced to eat small pieces of meat and ants' 'eggs' (pupae).

The plathander is the only frog we have ever seen that is capable of jumping backwards, and he can do this both in water and on land by a strong convulsive forward movement of the powerful hind legs.



Fig. 3. Plathander swimming.

Wait until he is lying peacefully at the bottom of his tank 'wropt in thought', perhaps thinking how nice he *could* look as a crest if given the chance. Then thump the table in front of him with the fist. Bang! With a "Goodness-me-what's-that?" look he propels himself quickly backwards to the far side of his aquarium, where he sits 'all of a twitter'. Thousands of generations of plathanders — beset by hungry fish, birds, crocodiles and water tortoises — have taught him this difference between the quick and the dead; the quick being those who get out of the way in time, the dead those who do not.

At times our *Xenopus* may be observed going through this exercise of 'advancing to the rear' again and again, without the application of a fistic stimulus.

"Ha ha," we say, "Wise little fellow; keeping your S.O.S. muscles in training for a rainy day."

Ignoring the mixed metaphor, he continues his acrobatics, and closer scrutiny reveals the fact that he is performing the evolution called "changing his skin," in other words "sloughing" or getting rid of his outer cuticle.

Practically all batrachians and reptiles periodically slough, the process being one of the accompaniments of growth, its frequency depending largely on age and food supply. Snakes and lizards as a rule accelerate the process by crawling through bushes or thick grass, whilst some amphibia get rid of their out-grown garb by weird contortions of their limbs and bodies.

Our slippery little friend accomplishes the disrobing feat by leaping where he cannot look amongst the weeds and stones of his native pond; and this is what he is attempting now, though both weeds and stones may be absent from his tank.

Xenopus has another useful faculty that stands him in good stead in the struggle for existence, and you can easily induce him to demonstrate it in the following manner. Get two large glass jars, partly fill each with water, and in each place a plathander. Now surround one with black paper or a black cloth, and the other with some thin white material.

In a short while it will be found that the animal in the former has turned practically black, in the latter a very, very pale yellowish brown. The advantage of being thus able to imitate one's background and to match perfectly either a mud or a sandy bottom is obvious, and this with his other faculties helps to explain the success of the plathander in the race of life.

Although as mentioned, the plathander is essentially an aquatic animal, it must not be supposed that he passes all his life in the water. He could, often does, and probably prefers to do so; but in our country where a river has been described as "a dry place running under a railway bridge," many charming little vleis that in winter form desirable residences for scores of *Xenopus* are converted into sandy hollows, or stretches of dried mud, gaping with cracks, that like parched lips seem to importune the cloudless sky.

And the residents? Do they migrate to 'take the waters' elsewhere or do they, in despair, follow the advice of Job's wife?

Possibly in certain exceptional cases some follow the first plan, and some others *may* succumb, though silently (except for an occasional very faint "Te-te-te-te" they are quite mute); but the great majority retire underground to the cooler damper subsoil, where they remain safely and snugly, probably without eating, until the winter rains arouse them to activity, and to the important functions of feeding and breeding. This temporary retirement is termed 'aestivating'.



Eggs of Plathander, nat. size.

As soon as the vleis have been formed afresh our little friends — friends? Yes certainly, surely the devouring of millions of mosquito larvae annually is a friendly act* — we repeat, our little friends deposit their eggs, attaching them in single-file and touching, along one side of a stalk of reed or water-plant. These eggs are little jelly spheres 3 mm. in diameter, the black nucleus being two-thirds as wide. The tadpoles emerge in a week, and for another week remain absolutely motionless, heads up, at or near the surface.



Plathander
Tadpole.
Nat. size.

They then commence to swim about, and may be seen in great numbers hanging vertically, heads down, in deepish water, maintaining position by a rapid waving movement of the very tip of the tail. They do not nibble at the slime and weeds like most tadpoles; but, through wide soft mouths suck in quantities of minute animalcules; thereby tending to purify the water. The soft feelers that project from the nose are probably sensory.

The time taken for the tadpole to develop into a complete froglet varies a lot with the conditions, and plathander tadpoles can, as a rule, be seen in the pools as long as these remain, but the first small froglets appear towards the end of October.

Xenopus laevis has a wide range over South Africa, Angola and East Africa.

Until quite recently it was thought that the widely distributed *Xenopus laevis* was the only member of this family to be found on the Cape Peninsula, or indeed in the whole Union of South Africa.

*See Appendix for this and all subsequent footnotes.

Lately (Feb. 1926) however, we have been able to demonstrate that a second and much rarer species exists in this district. With this species it has given us pleasure to be allowed to associate the name Dr. E. L. Gill, Director of the South African Museum, in recognition of the ever-willing assistance given to us at that admirable institution.*

Xenopus gilli is appreciably smaller than *laevis* and has a smaller more pointed head. The under-surface is yellow, often very vivid, and is usually marked with small dark spots (Fig. 4).



Fig. 4. Sago-belly Plathander (*Xenopus gilli*).

In habits it appears to be less essentially aquatic; and, though able to leap with greater agility, is far less excitable and boisterous than the more common species; also it is not nearly so slippery and difficult to hold. If, when out of water, it is touched on the nose, instead of jumping backwards, it more often 'cringes' its head downwards between its forelimbs in a manner suggestive of a more secretive habitat.

It has a much louder voice than *laevis*, and the rather drawn-out "Chee chee" made by both sexes, even uttered as it is under water, can be heard at a distance of ten yards or so. The emission of these sounds coincides with a sharp jerky depression of the head.

Three or four other species of *Xenopus* are known, from Rhodesia and Central Africa.



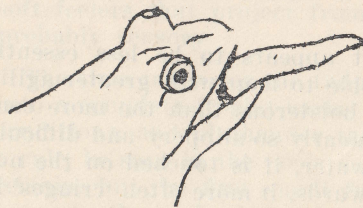
Fig. 5. Marbled Throat Frogs (*Rana fuscigula*).

CHAPTER THREE.

GRASS AND WATER.

One is often asked: "What is the difference between a frog and a toad?" or "Is 'such and such' a frog or a toad?"

The first question can be readily answered if altered to "What is the difference between a typical frog and a typical toad?" A typical frog as exemplified by the genus *Rana*, has teeth in the upper jaw, a moist smooth skin, no conspicuous skin glands, has long hind legs, is active, its usual mode of progression being by series of leaps, and its eggs are deposited singly or in clusters.



Tongue of Frog.

The typical toad belongs to the genus *Bufo*, has no teeth, has a dry warty skin with large glands behind the eyes, has shorter limbs, is comparatively slow, its more usual gait being a walk, and it deposits its eggs in long strings. Also there are important skeletal differences.

Between these two types, however, lie a great number of species, and these the most interesting, to which

neither term as defined is completely applicable. We have found it convenient to apply the term "frog" to all the tailless amphibians, except those actually belonging to the genus *Bufo*.

The genus *Rana* is a very large one, comprising over 150 species, and includes the common English frog, and the American and African bull frogs. It has three representatives on the Cape Peninsula, known as *Rana grayi*, *Rana fuscigula* and *Rana fasciata* (Fig. 6). These words are quite as easy to remember as are many popular names.

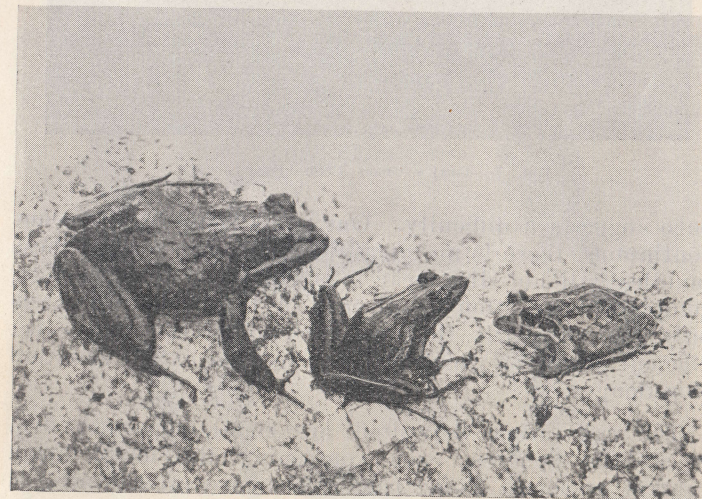


Fig. 6. Typical Frogs (*R. fuscigula*, *R. fasciata*, *R. grayi*).

Rana grayi or Gray's Frog may certainly be called the Common Frog by Peninsula naturalists, being found anywhere locally except in very dry localities. His call is a sharp "Click, click."

The shape is shown by the illustration, Fig. 7, but a considerable variety in colour and markings occurs. The male is far smaller than the female, and his throat is noticeably darker.

Large numbers of birds, snakes etc., find a ready food supply in the teeming thousands of these frogs, whilst the tadpoles which swarm in numerous puddles are preyed on by such voracious pond-dwellers as water-beetles, dragon-fly larvae, crabs, plathanders, etc.

Consideration of the habit of *Rana grayi* of spawning in or near rain-puddles as soon as these are formed, at



Fig. 7. Gray's Grass Frog (*Rana grayi*).

once suggests a difficulty. Our rains being by no means continuous, there is no guarantee that once formed these puddles will not disappear in a few days' time, causing complete destruction of all eggs or tiny tadpoles. It is only quite recently that we ascertained the simple yet efficient device by which *R. grayi* to some extent counters this danger.

The eggs when deposited are small, separate, firm crystalline spheres, each containing the usual black central nucleus. These eggs, which are often scattered round the bank of the pool, or on occasion deposited carefully in a cup-shaped depression in a neighbouring grass tuft, become distended with water. The nucleus quickly develops to an embryo, and then to a tailed tadpole, which can be seen twisting about inside the capsule, as it were, inside a fortune-teller's crystal. Moisture is soaked up from occasional rains and night-dews, but several dry weeks may be passed safely by the little tadpole in this condition. Then when heavier rains ensue, and the pools are more permanently formed, the little creatures burst from their capsules and wriggle or are floated into the water; where, a large part of their metamorphosis (that is to say their change from eggs to perfect frogs) being already accomplished, this is soon completed in the familiar manner. (Fig. 8).



Larva of
R. grayi X5

The little tadpole soon commences to nibble at the green slime (algae) and water weeds in the pool, the mouth being armed with horny teeth that can be seen with a small magnifying glass.* It breathes by means of gills, the water being taken through its mouth and emitted through a special opening in the left side of the body.

Shortly the limbs begin to grow, the first sign of them being two little buds at the root of the tail which gradually develop into proper hind limbs. The forelimbs commence to develop at the same time, but being covered by the skin beneath the gills, they cannot be

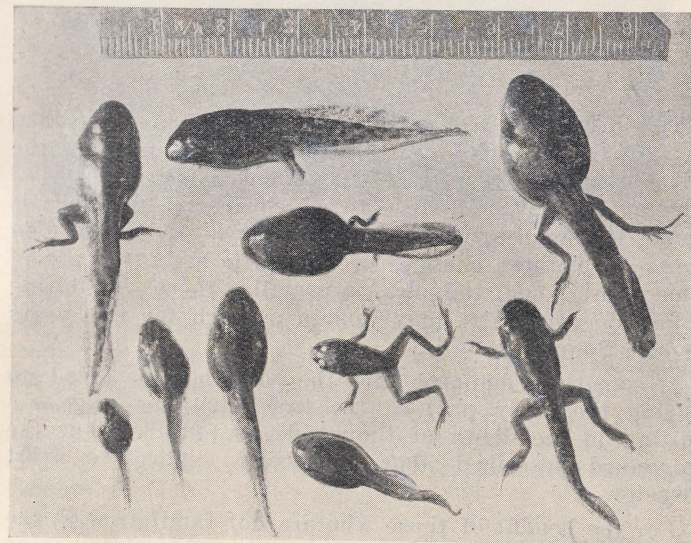


Fig. 8. Development of Gray's Frog (Rule is numbered in centimetres).

seen till later. The condition might be compared to that of a boy whose arms are folded inside his jersey instead of being thrust through the armholes. The left 'arm' generally appears first, being thrust through the opening we have mentioned, the right limb appearing soon after. The little animal now has four perfect limbs and a long tail.

During this time the lungs are developing, as is evidenced by the creature coming to the surface now and again to breathe. Then the gills gradually disappear, and breathing is accomplished by the lungs alone. The outer skin is shed, the horny jaws drop off, and the mouth

becomes wider and provided with a long tongue, the stomach increases in size, and the intestine, which in the tadpole is abnormally long, becomes considerably shorter. These modifications fit the animal for a change from a vegetarian to an entirely animal diet. Meanwhile the bony skeleton is hardening and becoming more defined, the legs are increasing in size and strength, and the tail has been gradually shortening. The entire absorption of this organ signalises the completion of the metamorphosis and the little frog is now in a condition to leave the water and to wander afield in quest of its insect food.



Left eye of
Gray's Frog X2.

This brief survey of a frog's development may be taken as fairly descriptive of the changes undergone by the tadpoles of most species of frogs and toads, some types varying slightly, and some to which special reference is made, having a specialised life history. In the case of *Rana grayi* these changes occupy quite a short space of time; but some tadpoles, especially those inhabiting colder deeper rivers, may remain as such for two years or even longer.

It sometimes happens that the pools become dried up during the early part of the free-swimming stage, resulting in the death of thousands of tadpoles, but the safeguard described above generally suffices to avert disaster.

For the benefit of those who are not familiar with the Cape Peninsula we might mention that the winter rains commence in June, and continue intermittently till October, the greatest rainfall being in July or August. The weather, though decidedly chilly, is never really cold, and frost and snow are almost unknown. In districts where the rains fall during other months of the year, there will naturally be a difference in the spawning time; and whilst the Cape paddas are most active, those in other localities may be hibernating.

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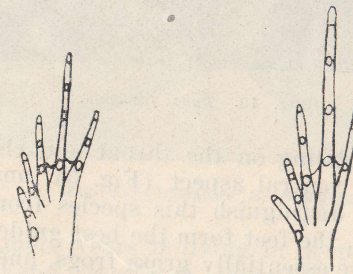
Somewhat similar in general appearance to Gray's Frog is the Long-Toed Frog (*Rana fasciata*) Fig. 9.

It may, however, be readily distinguished by the exaggerated length of the legs and toes and the greater sharpness of the nose.



Fig. 9. Long-toed Frog (*Rana fasciata*).

The colouring is very vivid, and a bright gold or brown stripe down the centre of the back is always present. From this striping its specific name is derived (Lat. *fascies* = a bundle). It has been called the Mountain Frog, and its favourite resort is certainly in the long grass beside upland streams, but it may also be found in great numbers at sea-level at the mouths of such streams.



Left hind feet of *R. grayi* (on the left)
and *R. fasciata*. Nat. size.

It is a most powerful leaper, and its habit is to dive through the long grass rather than to leap over it, a feat facilitated by the sharpness of its nose. The elongated

toes serve to give a foothold in grass tufts where a smaller foot would slip in between the stalks.

It is not a noisy frog, but now and again utters a slow "Chuck, chuck, chuck." The tadpole, long and rather thin, may be recognised by the bright stripe that is present even at this early age.

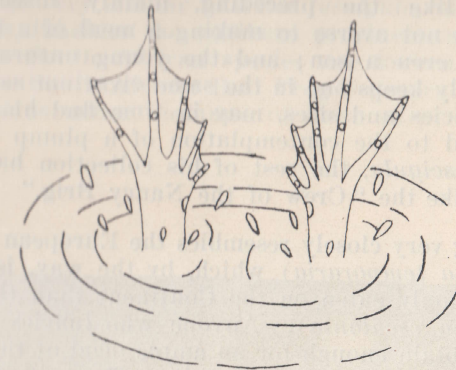
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The largest Peninsula frog is *Rana fuscigula* (Fig. 10), which, though small when compared to the bull-frog of the North and East, is quite a lusty chap with a body three inches or more in length. His name means "brownish or dusky throat," there being a distinct



Fig. 10. *Rana fuscigula*.

marbling or mottling on the throat and chest, at times over the whole ventral aspect (Fig. 5), and this generally suffices to distinguish this species from the others. Again, however, the feet form the best guide, for whereas the first two are essentially grass frogs, and have hardly any webbing between the toes (in fact they drown if compelled to remain in water for long), *fuscigula* has webbed feet, and is decidedly aquatic being seldom found far from water. His favourite situation is on a large stone or mud-bank beside a deep pool, into which he plunges with a triumphant "plop" on the approach



Plop!

of a stranger. He can stay under water for prolonged periods, and is second only to the plathander as a swimmer. The voice is a hoarse croak.

The eggs, about a thousand in number, are laid in sticky patches attached to weeds and stones in streams or vleis, and the tadpole at times attains to a large size, four inches being quite a usual length and up to seven inches having been recorded in exceptional cases. It is quite usual for these tadpoles to remain as such

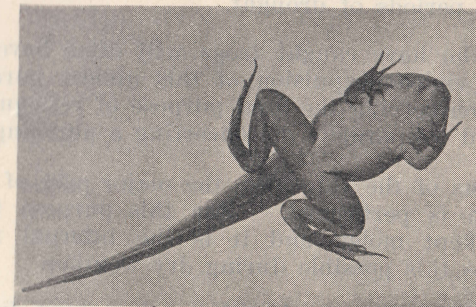


Fig. 11. Immature *R. fuscigula*.

for two or more years if living in deep cold water. On the other hand, *fuscigula* tadpoles may be found in shallow mountain trickles completing their short metamorphosis when only $1\frac{1}{2}$ inches long, the froglet being a tiny chap little more than half an inch in length. Fig. 11 shows a froglet just prior to the absorption of the tail.

Though like the preceding, mainly insectivorous, *fuscigula* is not averse to making a meal of a cousin, a nephew or even a son; and the young naturalist who thoughtlessly keeps one in the same vivarium as frogs of smaller species and sizes, may in time find his observation limited to the contemplation of a plump and self-satisfied *fuscigula*, the rest of his collection having disappeared like the "Crew of the Nancy Brig."

This frog very closely resembles the European Common Frog (*Rana temporaria*) which, by the way, is the one more commonly eaten on the Continent than the Edible Frog (*Rana esculanta*). Anyone who fancies this diet can soon obtain enough for an ample meal at the expense of a little appetite-giving activity. Two people should join in this venture, one to prepare and cook the dainties, and the other to eat them; one can hardly imagine the same person doing both. We still have a vivid mental picture of a corpulent Frenchwoman sitting with a struggling frog in one hand and a pair of *scissors* in the other, and a lap full of twitching, decapitated and eviscerated "grenouilles" — Ugh!

We may mention here that frogs never drink as we understand the word. The moisture, that is so essential to life, is all absorbed by the skin as opportunity offers from rain, dew, pond or stream, and can be stored up in a special internal water sac, to enable the animal to survive periods of drought.

Those who have caught frogs will often have experienced the violent expulsion of this almost pure water, the emission serving the dual purpose of relinquishing a burden and temporarily disconcerting a pursuing enemy.

By means of the skin also, the major part of a frog's respiration is performed. For this purpose the skin must be kept moist, and it is the internal reservoir that makes this possible during dry weather.

We need hardly mention that tales about frogs falling from the sky with rain are absolutely mythical, having no better foundation than the faulty observation of the few and the credulity of the many.*

These three frogs have a wide range in South Africa, *Rana grayi* being found in Cape Province, Natal and Zululand, *Rana fuscigula* in the Cape, Transvaal and Orange Free State, whilst *Rana fasciata* is found as far north as Rhodesia.

A species very similar to *Rana fuscigula*, namely *Rana angolensis*, inhabits the northern provinces, and four or five other South African species are known. As mentioned, the South African Bull Frog is generally included in this genus under the name of *Rana adspersa*.



Fig. 12. "Good bye" (*R. fuscigula*).

A GNOME.

We have said that the African bull-frog (which does not come into our Peninsula list) is placed in the genus *Rana*, but classifications of twenty years ago gave to it, and to some other types, the generic name of *Pyxicephalus*. Later systems have merged this genus into that of *Rana*, but some systematists still consider that the older ruling is preferable.

Into any scientific argument we cannot venture to enter; but certainly from a naturalist's point of view, the species of the genus in question that is found in the Peninsula, shows little affinity to the local *Ranae*. Personally we like its old name *Pyxicephalus delalandii* (the first word meaning Box-head) with its convenient abbreviation to Pyxie, and, with the above disclaimer, will use it in this book.

The name "Pyxie" immediately suggests a little fairy, but there is nothing fairy-like about our *Pyxicephalus*, as he is of decidedly heavy build, or 'stout habit' as it is termed, in outline more resembling a toad, and completely lacking that appearance of slim agility so characteristic of the three frogs just considered. But if not a fairy, he certainly has some of the attributes of a GNOME, as he is an accomplished digger, and finds in an underground retreat, that safety from enemies not accorded to him by speed.

If a Pyxie be placed on a flat surface, it is seen that the soles of the feet are not laid flat thereon, but are directed backwards and outwards (Fig. 12); also that on the inner 'heel' there is a marked tubercle, and it is by the outward and backward shuffling of these specialised feet, that he is able to dig himself into the sandy soil he favours. If disturbed in this funk-hole, he swells up his body to an extent exceeded only by the *Blaasop* (*Breviceps*).

Colour varies a good deal according to light and background, but a very light grey is usual. The underside is white, but in the case of the male the throat is very dark.



Fig. 13. The Pyxie (*Pyxicephalus delalandii*).

Often at night during the breeding season, the male may be heard making his typical mating call, a rapid tinkling cluck, "Tuckle, uckle, uckle"; the female's reply being comparable to nothing so much as the whine of a door-hinge.*

Resort is only made to water when breeding; the eggs, small and sticky and in number about 2500, being deposited from June to August.

The tadpole can be easily recognised, being a short fat one, shaped much like a conventional heart; the very small tail filling the notch.

Though quite a common frog, *Pyxicephalus* is not a familiar one, as during the drier weather he remains underground, emerging now and again on cool nights to obtain his insect food.

Pyxicephalus delalandii is widely distributed over South and Tropical Africa, whilst his large cousin *Pyxicephalus adspersus* (or *Rana adspersa*) the South African Bull-frog, is well known in the north and east of the sub-continent.

CHAPTER FIVE.

THE ARUM FROG.

It must be granted that many batrachians cannot be styled things of beauty by even their most devoted admirers; but on the other hand, others may well delight the artistic eye by their gracefulness of form and delicacy

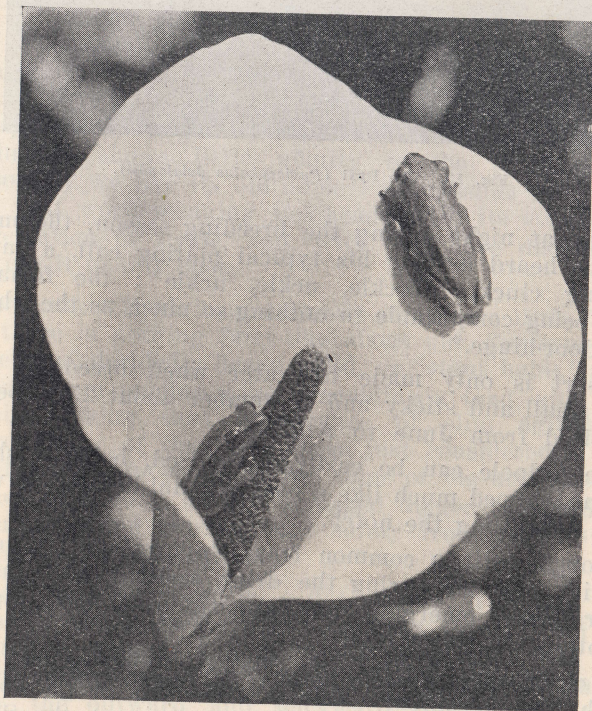


Fig. 14. Arum Frogs (*Hyperolius horstockii*).

of colour. To pre-eminence in this respect, there are doubtless many claimants, and one is anxious to avoid the all-too-common tendency to apply the superlative degree to everything local. Still, putting aside as frivolous the suggestion that the 'Judgment of Paris' would be in favour of the Edible Frog (*Rana esculanta*),

we suggest that a slice at least of the golden apple might well be awarded to the subject of this chapter.

At certain localities on the Cape Flats, if we examine enough Arums, especially such as are growing in shallow water, we may find, crouched down in the shady recesses of the bloom, a small yellowish-white frog (Fig. 14). This is the Arum Frog, known scientifically as *Hyperolius horstockii*.

Snug and secure he sits there, sometimes holding to the spadix, but more often with his back to it; relying for safety on concealment, immobility, and almost perfect harmony with his background. Notice that his feet are tucked well under the body, and the eyes are half closed and themselves light coloured.

Now tap the stalk of the Arum with a stick and watch the sudden transformation. The inert-looking creature becomes endowed with life and vigour, the long brightly coloured legs appear (Fig. 15), a few quick steps up

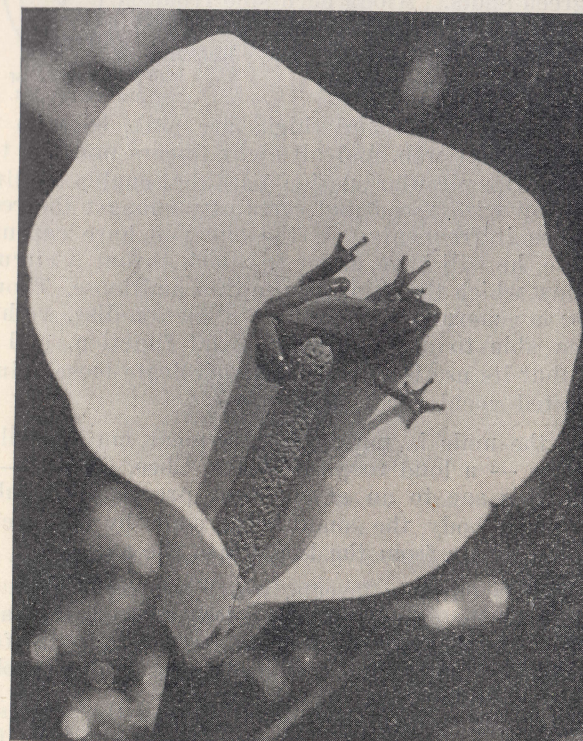
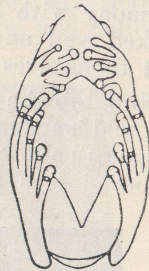


Fig. 15. Alarmed.

the bloom, a flying leap, and the frog is clinging to a reed stalk or a bloom a couple of feet away, a second leap probably taking him out of sight amid the reeds.

Sometimes he disappears at once in a most mysterious manner. Leaping as he does with outstretched limbs into the rushes, should only one toe touch a stalk, the little frog instantly pivots thereon, swinging round to the opposite side of the reed and crouching there motionless and invisible. If greatly alarmed he will dive down into the water, disappearing instantly among the roots.

Let us capture the next one and examine it carefully. The body, long, narrow and somewhat leaf-like in shape, is something over an inch in length and of a colour that — according to surroundings and light — may range and change from the colour of old ivory to dark brown, and may very occasionally show a few green spots. Along each side from the eye runs a two or three-fold stripe of varying shades of silver grey, brown, yellow and at times green.



Undersurface of
Arum Frog. Nat. size.

The hands and feet and thighs are pink, between the toes is a distinct web, and all eight fingers and ten toes have at the tips circular suction-discs that enable the little frog to leap with speed and certainty amongst the reeds and rushes it frequents. If the one you have captured be a male, he will have under his dark throat a circular disc, below which the skin is quite thin and loose. Though this disc is generally spoken of as a suction-disc, we have not been able to detect any suction function, and we believe that its use is to protect the delicate loose skin of the deflated vocal sac.

When the male is making the typical mating-call of the species — a loud rasping "Chee, Chee, Chee" — he distends this sac to an extent that practically doubles the size of his body, the sound being made by the forcible propulsion of air from the lungs into the sac.

The food is entirely insects, which are secured by the protrusion of the sticky tongue, a leap often being taken to secure such as do not approach closely enough, the frog, its prey secured, alighting gracefully as a skilled acrobat.

Although the typical habitat of this little frog is in the Arum, it is obviously only for part of the year that this retreat is available, and resort is made to various

grasses, reeds, and bushes, the tufts of *Restio* so common on the Flats, being much favoured.

In this position a second type of camouflage, in this case depending on form and attitude, appears to be demonstrated.

One of our photographs (Fig. 16) shows a number of Arum Frogs in a clump of *Restio*, and the manner in which the little creatures seem deliberately to mimic

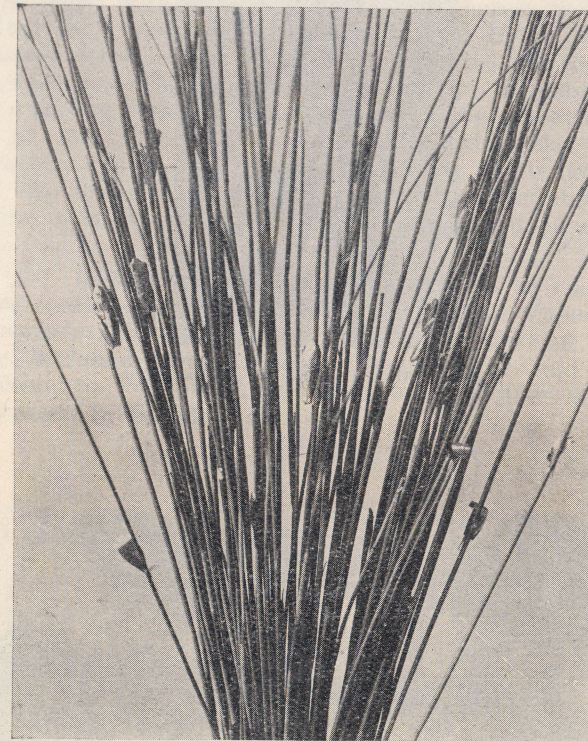


Fig. 16. Arum Frogs on *Restio*. Count them.

the scale-like leaves of the reed is remarkable. Can you count how many frogs there are? It is interesting to note that even when clinging to these thin stalks the feet are always laid against the stalk, without the toes or fingers clutching it (Fig. 17), reliance being placed entirely on the adhesive property of the digits.

As immediately after the first rains and also after the drying up of the temporary vleis, Arum Frogs may be found in situations miles distant from the nearest per-

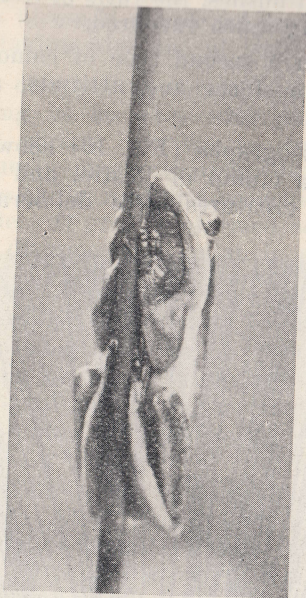


Fig. 17. Arum Frog holding a grass stem.



Fig. 18. Eggs of Arum Frog partly developed.

manent water, it is presumed that like several other species, they aestivate in the damper subsoil; but positive proof, i.e., finding one under such conditions, has not yet come within our observation.

Until recently the breeding habits of this little frog were not known and it was even suggested that they used the Arum bloom as a ready-made egg-cup; but some of the inmates of one of our vivaria settled the matter by an actual demonstration.*

The eggs, with jelly capsules 4 mm. across were deposited in November in clusters of from 10 to 30, and attached a few inches under the surface to the roots of water-plants. The egg nucleus, 2 mm. in diameter was white on one hemisphere and *brown* on the other; differing in this respect from that of all the other local batrachia. In Fig. 18 the eggs are shown partly developed. The tadpoles were small, inactive, quadrilateral in outline, semi-translucent, with a russet-brown pigmentation.

*Hyperolius horstockii** appears to be confined to the south coastal districts, but its relative *Hyperolius marmoratus*, the beautiful and variegated Marbled Rush Frog, is found from Angola to Mosambique, and from Rhodesia to Pondoland, and four or five other species are known in South Africa.

A CHIRPING FROG.

"Chirp, chirp, chirp."

These words are conventionally used to indicate the high-pitched song of the cricket, and may be taken to denote a sound now becoming insistent. We are sitting in one of the beautiful shady glens, wherein those who picnic on the upper slopes of Table Mountain find such pleasant shade, and those of us who are in our fifth decade, so welcome a breathing-place.

It is very peaceful here under the trees. Through a gap in the foliage, as though a window, can be seen a narrow section of the Cape Flats; rolling dune and reed-fringed vlei, a farm or two with clustered cottages shimmering in the sunshine; whilst, in the distance, a jagged mountain ridge rises sharp cut against the clear blue sky.

Calm and peaceful, but not silent. A hurtling Carpenter Bee, *Xylocopa capensis*, 'szuzzes' past bearing a load of pollen to a betunnelled oak. From a distant mountain-path come the clear voices of a party of youths and maidens, summit-bound, to spend the bright Sunday hours healthily and happily in a "Temple not made with hands." Nearer to us the stream tumbles tinkling over the rocks, leaves rustle gently together, whilst ever and anon that high-pitched "Chirp, chirp, chirp" assails the ear.

"There goes that cricket again. What a shrill piercing sound to be made by the inter-friction of an insect's wing-cases," we muse lazily, then more alert: "But is it a cricket"?

The attentive ear notes a slight difference in the quality of the note, and, curiosity triumphing over somnolence, we proceed to investigate. Cautious stalking at last runs the quarry to earth in a clump of moss, which, on the steep wall of the glen, is soaked by a seeping trickle. And surely enough it is not a cricket, nor any other insect, but a tiny frog just three-quarters of an inch long, and of a bright brick-red colour (Fig. 19).



Fig. 19. Chirping Frogs (*Arthroleptella lightfooti*) with house fly.

This is more interesting than we had hoped; so a systematic search is undertaken, resulting in the discovery of several other tiny batrachians exactly like the first, except that the colours are less vivid, ranging through various browns to black, and a considerable range of individual colour change seems attainable. The under-surfaces of some are quite black, of others quite white; and it is suggested that these are males and females respectively (Fig. 20).



Fig. 20. Under surface of male and female Chirping Frogs.



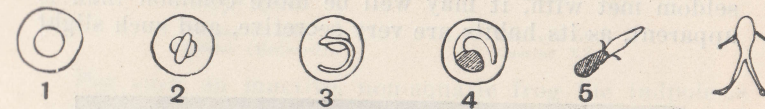
Fig. 21. Three Chirping Frogs, with partly developed eggs on moss.

But this is not all. Adhering to the damp moss are found several clusters of jelly-encased eggs, each with a large *white* nucleus. Fig. 21 shows three of the little frogs on the moss beside the comparatively enormous eggs. Despite this very large size of the eggs as compared with the little frogs, we conclude — as it happens, rightly — that we have secured parents and progeny; and we bear our finds homeward, well pleased to have made an interesting, and, as transpires, a hitherto unrecorded discovery.

At home we are able to examine the jelly eggs more closely; and, by keeping the moss damp, to watch the complete metamorphosis. Each globule measures 8 mm. in diameter, the white nucleus being $4\frac{1}{2}$ mm. It is interesting to know that the enormous bull-frog, which is perhaps 500 times the size of our little chirper, is developed from an egg that is only about one eighth of this size.

In some globules the nucleus has already developed into a tailed embryo, which wriggles about in its jelly capsule, when this is touched. These little embryos, at first white, gradually darken, except for the tail, which remains translucent. Shortly we see tiny hind-legs appearing, and some of the little creatures burst out of the capsules and wriggle about in the moss.

Are they tadpoles? All the tadpoles we know can swim, let us try them. A bowl is brought, and the experiment made with a couple. They fall to the bottom, and twitch about in such a helpless manner, that they are rescued with a spoon, and put back on their moss. Here development proceeds rapidly, a few days sufficing for the appearance of the fore-limbs and the absorption of the tail, and in a week to ten days from the discovery of the 'nests' the tiny froglets, one fifth of an inch in length, are hopping about, and eating such minute insects as come within leaping distance. In cooler weather the period of metamorphosis is much prolonged.



Development of Chirping Frog. Nat. size.

This interesting little frog is now known to science by the name of *Arthroleptella lightfooti**, and for an appropriate popular name may be styled the "Chirping Frog."

He appears to be confined to mountainous districts, where as a rule the only available water is a rushing torrent, which the tadpole of such a tiny frog could not possibly stem; and in this probably lies the explanation of the unusual breeding habit.

In another chapter we shall note how the tadpole of another species, confronted by the same problem, has, instead of avoiding the difficulty, successfully countered it.

CHAPTER SEVEN.

THE CASSINA.

The Peninsula variety of the *Cassina* family, known scientifically as *Cassina wealii quinquevittata* (Fig. 22), is much smaller than its cousins up-country, the largest one we have seen being just 29 mm. long. Though seldom met with, it may well be more common than is apparent, as its habits are very secretive, and such slight



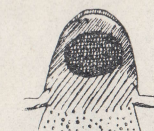
Fig. 22. The Cassina (*Cassina wealii quinquevittata*).

activity as it does display is mainly indulged in at night. It does not hop, crawls rather slowly, climbs a little, and is only a moderate swimmer.

The markings are as follows: Dorsal surface silver-grey with brown vertebral stripe from between the eyes nearly to the vent, two brown lateral stripes two-thirds the length of the body, merging near the vent with the vertebral stripe. Legs silver-grey striped or dappled with brown. The male has a dark throat, and a large vocal sac, external to which is an oval suction disc. At

times the dorsal surface becomes almost black, the marking being then indistinguishable. The pupil of the eye is vertical.

We have found one or two young ones in the mud beside a temporary vlel, but most have been obtained by breaking up decaying stumps of clumps of reeds (*Restio*), which seem to be a favourite lodging place; or by rearing from tadpoles.



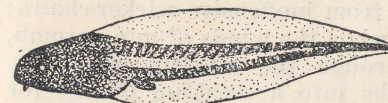
Throat of male
Cassina (Reduced).



Left eye of
Cassina X2.

For such an inactive, non-aquatic frog the tadpole is remarkable. It has a fairly long and very broad and powerful tail, the membrane of which is continued half way up the body dorsally and ventrally, which makes the swimming action extremely rapid when alarmed, more like that of a fish than an ordinary tadpole. Along the axis of the tail on either side runs a bright golden or silvery stripe about 3 mm. wide.

The tadpole grows to a considerable size, and all four limbs and body shape are fully developed before the tail shows the slightest sign of absorption (Fig. 23). The body of the tadpole is only slightly smaller than that of the adult frog, and the weight including the tail, greater. The total weight gradually diminishes as the tail shrinks. When once the shrinkage of the tail has commenced,



Tadpole of *Cassina*. Nat. size.



Immature *Cassina*. Nat. size.

it is very rapid considering the amount of the material to be absorbed. One tadpole that had a complete tail 52 mm. long on Dec. 27th., showed only the barest vestige on Dec. 30th, the body being perceptibly fatter, though no food was taken in the interval.

The eggs are deposited in October, and small *Cassina* tadpoles may be caught in mid-November. The length of the time taken for metamorphosis varies, as with other



Fig. 23. Development of Cassina.

tadpoles, with temperature and food supply, but Oct. 1st to New Year probably covers the average span.

The tadpoles follow the general habit in feeding on algae and water weeds, the frog eating flies and other small insects, catching them with its extensile tongue. It lives very well in captivity if kept in a suitable vivarium, and soon becomes tame enough to take flies from the fingers, looking up optimistically whenever the cover is removed.

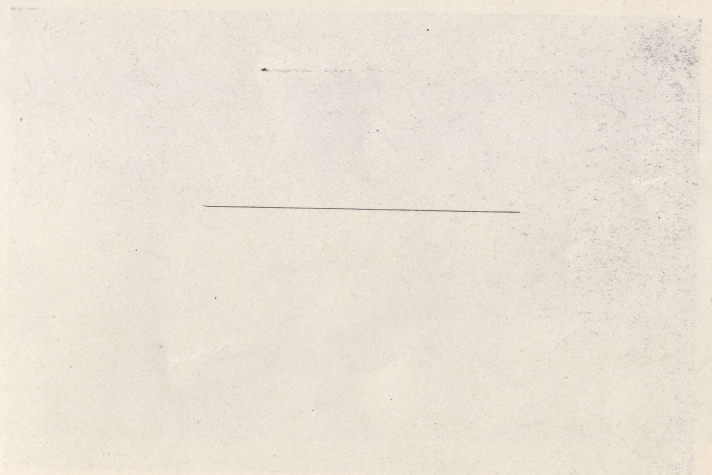
The vocal sound is a loud strident creak that irresistibly reminds one of those protesting squeaks that our less buoyant friends call forth from inoffensive wicker-chairs; or, our mood changing, as when the winds of late autumn, sighing and sighing through the dismantled woods, sway the stiffening boughs into a creaking lament for the dying year.

When making this curious call the male frog distends his vocal sac to an extent equal to about one third the size of his body.

The Cassina genus has a wide range throughout South and Tropical Africa. The best-known member, *Cassina senegalensis* attains a length 40 mm. ($1\frac{3}{4}$ inches). Curiously enough this species has an entirely different mating call, which has been described as resembling nothing so much as the popping sound made by the

drawing of a cork from a bottle.* This strange noise, considered in conjunction with the 'stoep-chair' call of the Peninsula type, almost suggests the conceit that these little frogs, by thus reminding the tired and thirsty naturalist of the material comforts that await him at home, are hinting that he should leave them to the undisturbed transaction of their own domestic affairs.

The scientific name of this genus (pronounced Ca-seen-ah) is so short and simple that we may well adopt it for general use.



CHAPTER EIGHT.

A TINY FROG.

A fully grown frog as small as a house-fly. Surely that is twanging the long-bow too lustily?

Well, perhaps we had better be on the safe side, and say "As small as a blue-bottle or blow-fly." Even that is pretty small for a frog, is it not? Anyhow the fly in the photo (Fig. 24) is an average-sized house-fly.



Fig. 24. Micro Frogs (*Microbatrachella capensis*) with house fly.

In spite of his small size he is a very self-confident little chap, and to see him perched on a leaf, — his vocal-sac, which continues over his whole ventral surface, extended to a size equal to that of his normal body, the



Vocal sac of Micro Frog X2.

while he utters his high pitched squeaky "Tschik, tschik, tschik," — is to realise that size is not essential to self-importance.

We first came across him when; taking a short-cut across an arm of one of those charming little vleis, that the winter rains form flower-fringed in the dune-bound hollows on the Flats (Fig. 25); a tiny frog was seen making a hurried and successful escape amongst the reeds. What was it? A very infantile *Rana grayi* or *R. fuscigula*? Certainly not: even the fleeting glance has shown that the swimming action is different; so haversacks are dumped on the nearest dry ground,



Fig. 25. A Typical Vlei.

collecting jars taken out, and a knee-deep investigation embarked upon.

"Here's one," comes from our young companion, "And another, a bright green one; how many have you got?" "Only five" we reply, shamelessly adding four to our catch — we cannot allow these young people to crow over us — "Don't get more than ten for the present."

Some time later a shout announces the attainment of this number, and adding our own bag, now doubled, we examine the whole dozen.

Are they fully grown? About the young of most animals there is a sort of innocent look, that suggests immaturity; and, unless our imagination carries us away,

this dictum holds good even amongst frogs. Also in a collection of juveniles one seldom gets that exact uniformity of size that characterises the occupants of our jar.

But if there is uniformity in size, there is certainly none in colour or markings. Some are pale-green, some are bright-green, and some are dark-green, some are light-brown and some are dark-brown, whilst greys, fawns, russets and blacks are all represented, either in this or in subsequent collections.

Some are uniformly coloured; whilst in many a narrow pale or green vertebral stripe is present, in some cases flanked by broader lateral stripes of the same colour. Others again are speckled like granite, and many have slightly warty backs.

The stomachs also show a great variety of mottling, marbling or speckling, and some are a plain brownish white. The toes are $\frac{1}{3}$ to $\frac{2}{3}$ webbed, and considerable agility in swimming and jumping is displayed.

At home a large glass jar, half-filled with water, with plenty of grass and water-weed, forms an ideal "vlei" for the observation of their habits. Here it is noticed that the individual colour may vary from time to time, bright light and contentment appearing to induce the brighter shades; and here numerous eggs are laid.

These eggs, which are very tiny, are deposited from June onwards in clusters of twenty or so, attached to grass-stalks a few inches below the surface of the water. The tadpoles grow to what is proportionately a very large size; the froglets, which commence to appear early in December, being, as is seen by the one in the picture, little smaller than the adults.

By systematic searching later, we have found that these tiny frogs have a wide distribution on the Flats from Crawford to Strandfontein, and occur on some low-lying parts of the Peninsula; but from high ground they appear to be entirely absent, nor have they been recorded as yet from any other part of South Africa.

Submission of a number of specimens to a scientific authority has resulted in the little fellow being accorded the descriptive but somewhat overwhelming name of *Microbatrachella capensis**; but he shows no marked objection to the name of "Mike," by which we have found it convenient to call him. For a popular name we suggest "The Micro Frog."

* * * * *

In similar localities to the above, but only one per cent. as numerous, we recently discovered another little frog so similar in size and general appearance, that an accustomed eye is required to detect the difference. Although in our opinion deserving of a distinctive specific name, this frog is for the present classed as *Cacosternum boettgeri* (pron *bit-ger-i*) (Fig. 26), a species common in some other parts of South Africa, up to Northern Rhodesia.*

Dorsally this species is quite smooth, the colours being grey or brown with a thin vertebral stripe; and there

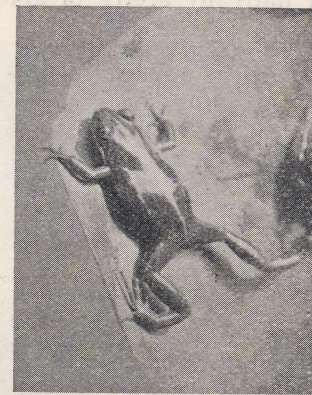


Fig. 26. *Cacosternum boettgeri*.

appears to be little or no power of individual colour change. The spots on the stomach, instead of having an irregular outline are small and circular, the legs are stouter and are extended more laterally, giving the animal a flatter appearance, slightly suggestive of a tiny plathander.

In habits they are less aquatic, the feet being quite devoid of web. We have found many during the dry season, by breaking open clumps of *Restio*, a retreat also favoured by the Cassina.

We have never found the Micro Frog in this situation, but have occasionally dug it up on the site of a temporary vlei.

CHAPTER NINE.

A FURTIVE FROG.

The story of how this little frog came to be added to the list of known batrachia is rather curious.

A small open golf-links within 5 miles of Cape Town, that is traversed daily by scores of golfers, and many



Fig. 27. Type locality and breeding site of Cross-marked Frog, Gray's Frogs, Pyxies and Sand Toads also resort to these and similar puddles to spawn.

hundreds of pedestrians, that is entirely surrounded by houses, and that for two-thirds of the year is parched and bare, is hardly the place where even the most optimistic naturalist would expect to find a new species of frog, or indeed any frog at all.

Yet such (the appearance of which after the rains is shown in Fig. 27) is the dwelling-place of our present subject, a secretive animal, that until recently had quite escaped notice. One day (July 1924) one of our co-partners (aged 13) brought home a little dead frog that he had found when crossing the links. Although its appearance could not be reconciled with the description of any known species, the possibility that it was new was not considered likely; however it was photographed and carefully preserved, and diligent search was made for others on numerous occasions. It was not until some months later that a second and very juvenile one was found.



Fig. 28. Cross-marked Frogs (*Cacosternum capense*) male above.

These two were then submitted to an expert authority, who pronounced them to be of a quite new species, to which he gave the name *Cacosternum capense** (Fig. 28).

No further specimens could be found until the onset of the heavy rains (June 1925) when, by squelshing round some of the puddles on the links with an electric torch at night, a few more were obtained. In the hope of getting enough for a complete investigation of the

habits of *C. capense*, the youngsters were offered 5/- a dozen for captures.

The rain the next day was torrential, but the young Nimrods sallied forth, and, an hour later, returned like drowned rats, but with *sixty-four*. Later on, dried and warm, loud and triumphant was their welcoming cry of "Twenty-six and eight pence, Dad."

The males, easily recognisable by their dark throats, were one-sixth smaller than the $1\frac{1}{2}$ inch females, which strangely enough they outnumbered six to one.

"We will leave them in the house to-night" we said, "so that we can listen carefully, and note the nature of their vocal sound."

Listen carefully! In what should have been the still watches of the night, from their vivarium sure enough came the vocal sound, or rather the two vocal sounds. One, the rather placid metallic "Tock, tock, tock" was not more disturbing than if several rivetters were at work on a large boiler; but the excited "Cree, cree, cree," like a dozen squeaky slate-pencils being drawn perpendicularly across a dozen slates, was carrying a joke too far, and the vivarium passed the rest of the night in a corner beneath a mound of cushions, which somewhat muffled the strains of the batrachian orchestra.

Luckily this serenading was only kept up until pairing took place, the unmated males being either released or otherwise disposed.

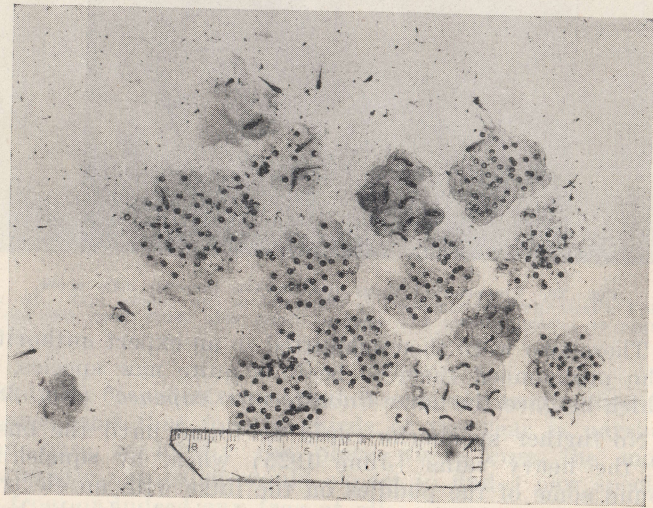


Fig. 29. Eggs and larvae of Cross-marked Frog (Numbers on rule indicate centimetres).

Scientific investigation, and the needs of museums, occasionally necessitate the killing of one or two of one's specimens; and it is satisfying to know that instantaneous and painless death results from immersion in water containing a few drops of chloroform.

The greatest number of eggs obtained from one pair was 400. The jelly part was sticky and measured 3 mm.; the nucleus, white on one side and black on the other, being only one-third of this. In Fig. 29 several clusters of spawn are shown, also some tiny larvae, both in the jelly capsules and free. The figures on the rule represent centimetres.



Fig. 30. Later stages in development of Cross-marked Frog.

The grey-coloured tadpoles when fully grown, were marked dorsally with small bright green or orange spots, as were the froglets, which were complete early in September. Stages in the development as shown in Fig. 30.

Cacosternum capense may be readily distinguished from every other Cape frog or toad by the large black or olive-green blotches on the stomach. The back is somewhat warty, and the cross-shaped mark thereon shown in the photograph, is also distinctive.

The gait is either a short quick run or a series of short hops or rather flops, the legs being to the side rather than tucked underneath, as is the case with the powerful leapers. For this reason they appear very flat when at rest, lying on their stomachs rather than sitting.

The domestic event transacted, some were kept in an aquarium containing a few inches of sand, just covered with water, to simulate as nearly as possible a natural puddle (Fig. 31).

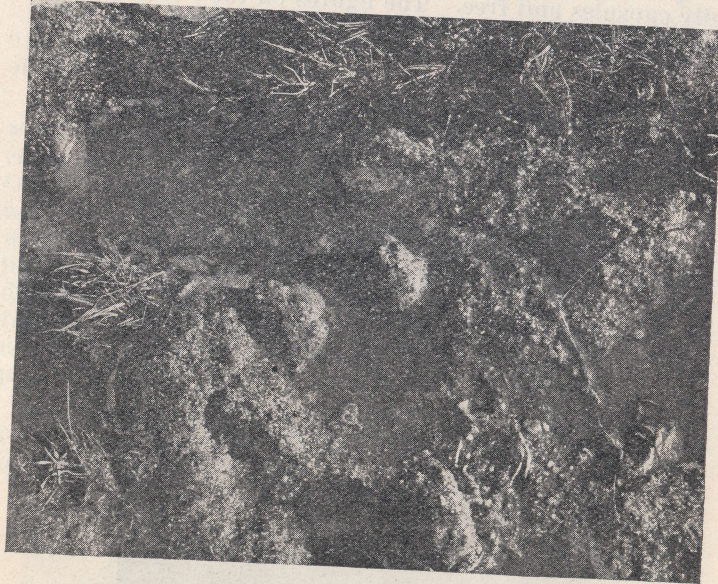


Fig. 31. Three Cross-marked Frogs in typical habitat.

It was thus noted that they lay for days buried in the sand, with the tip of the nose barely showing. This habit, coupled with the fact that during the dry weather they remain almost entirely underground, may account for their having for so long escaped discovery.

Such, omitting technical details, is the whole story of *Cacosternum capense*, on which we bestow the name "Cross Marked Frog." It would be of interest to know if this frog is to be found in other parts of South Africa.

CHAPTER TEN.

THE BLAASOP.

The globular little chap we will now consider reminds one irresistibly of an old man grown stiff-jointed from age, and corpulent from good living. However, he is not dilated by "too too solid flesh" but by wind, and this not the aftermath of a blow-out, but as the result of a blow-up, as one of his popular names, "Blaasop," indi-



Fig. 32. Blaasop (*Breviceps gibbosus*).

cates. His other common name is "Reen Padda" or "Rain Frog," which probably indicates a propensity to emerge from concealment at the advent of rain; but as this is a habit shared by almost every other batrachian, it cannot be regarded as a distinctive title.

Perhaps with this, as with many other animals, the scientific name is simplest and most appropriate. *Breviceps* meaning 'short head,' is the name given to this exclusively African genus, the various species being further identified under specific name indicative of some physical

characteristic or of geographical distribution, such as "*macrops*" (large eye), a Namaqualand type, or "*mossambicus*" from P.E.A. Rhodesia, Transvaal, Natal etc.

The specimen portrayed (Fig. 32) is of the best known Cape species, *Breviceps gibbosus* (humped, swelling, resembling a nearly full moon). The illustration shows the generic and specific characteristics — the short head and flat face, the stumpy legs, the lunar shape, and also the numerous small warty excrescences, that on irritation are capable of secreting an acrid fluid as a protection against enemies. The manner in which the eyes look forward instead of outward should be noted, and attention

is specially directed to the peculiar looking foot, as it is the varying shape of this that is now largely used as a means of scientifically differentiating the various species.

Breviceps gibbosus may be regarded as a rather rare batrachian, mainly on account of its secretive habits. It is essentially a burrower, digging its way backwards into the earth by outward kicks of the hind feet, which are armed with a spade-like tubercle. The kicking action is accompanied by a slow revolution of the whole body, which turning movement is, as far as we have noticed,

always made clockwise. The main diet is probably termites, and the very broad, sticky tongue is well suited to secure a considerable number at each dab.

Often when first captured the blaasop startles its captor by emitting a shrill squeak like that made by a mouse.

Elsewhere in this book we make reference to the extreme and most interesting diversity of habits in members of the same families, even in such a small area as the Cape Peninsula. We have seen in the Plathander (*Xenopus laevis*) an example of this specialisation; its enormous webbed feet, powerful hind legs and sharp nose being pre-eminently adapted to a life in the water.

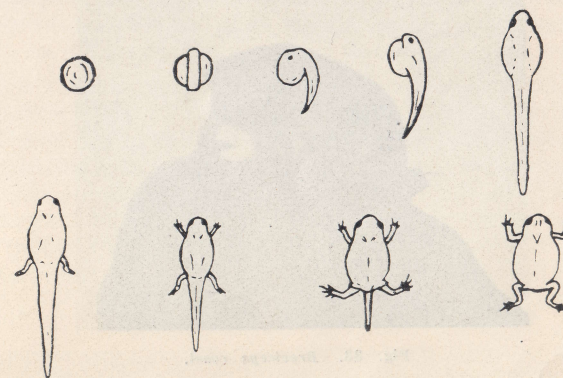
In the *Breviceps* family we reach a supreme limit of the non-aquatic habit. Far from being as much at home in the water as a fish, *Breviceps* is absolutely unable to swim, and never voluntarily enters the water. If placed therein it swells itself up with righteous indignation and lies helplessly like a crippled balloon, apparently waiting for wind and wave to waft it ashore. It is possible that here we have the real reason of this power of self-inflation,



Left foot of
Breviceps
gibbosus X2.

inasmuch as it would prove a more certain help in seasonal flood and spate, even than the ability to swim, "Every *Breviceps* its own lifebuoy" may well have been its evolutionary slogan.

If then, it never enters the water, how is the spawn deposited? Here we come across another of the wonders of our paddas. For a long time past it has been presumed that some specialised mode of development had been evolved by the genus, owing to the fact that the animal is to be found at times 50 miles or more from the nearest surface water. Its build hardly suggests an annual pilgrimage of 50 miles each way to deposit its eggs, and the method adopted by *Breviceps parvus* has lately been discovered.*



Development of Blaasop. Nat. size.

It appears that a few large eggs are deposited by the female under a stone or in an underground chamber, and the complete metamorphosis takes place in the egg-capsule, the tiny progeny emerging fully formed. Although omitting the swimming stage of its existence, it is interesting to note that the developing larva grows the usual tadpole tail, and also has gill-slits. The discovery of any 'nest' attributable to *Breviceps gibbosus* or any other member of the genus which doubtless follows a similar habit, would be a valuable addition to our natural history lore, and entitle the finder to a small niche in the Temple of Fame.

Up till recently *Breviceps gibbosus* was regarded as the only type of this genus to be found on the Peninsula, but lately two other species, both entirely new to science, have been discovered.*

Of *Breviceps rosei*, smaller, slimmer, smoother, less globular, and considerably more agile, only two specimens have been found, one on the Flats and one on the mountain-side, the type specimen (Fig. 33) being a female actually containing about 20 large yellow eggs.

Most frogs have their eyes so directed as to look out on either side of them. Many others, notably the aquatic types, maintain a more celestial outlook, a few, such as *B. gibbosus*, look straight ahead, but to the best of our belief no other batrachian in the world has its gaze directed downwards in the modest unassuming style of this engaging little creature.



Fig. 33. *Breviceps rosei*.

Though we found her under a dead *Restio* tuft, in our opinion she was wont to range abroad at night, trotting about dabbling her somewhat slender tongue at the ants and small beetles that her downcast eye would bring more clearly to her view. As was the case with the only other specimen recorded, taken about a year later, half way up Devil's Peak, this *Breviceps* was found in a somewhat damper locality than is as a rule favoured by the common *Blasop*. This may be chance, or it may indicate a definite habit.

Breviceps montanus is possibly restricted to the mountain, and seems to be a still smaller type, the first one we came across, whilst digging out a lizard on Devil's Peak, being at first glance taken for a very large spider. It is somewhat more active than *Br. gibbosus*, but less so than *Br. rosei*. The little wart glands of its skin are larger than in either of these two other species.

* * * * *

Breviceps gibbosus occurs in both Cape Provinces, Natal, Orange Free State and the Transvaal; a large eyed type, *Breviceps macrops* in little Namaqualand; whilst *Breviceps mossambicus* has a wide range over Natal, Zululand, the Transvaal, Rhodesia, Mozambique, Angola, and South West Africa. In all ten South African species are known.

CHAPTER ELEVEN.

A UNIQUE TADPOLE.

The general appearance of a tadpole is well known to everyone, and a sufficiently close likeness exists between the tadpoles of most of the Peninsula amphibia to make a differential description a theme of interest to the close student rather than to the general reader. Some, however, are of such outstanding interest and importance, that even a modest work such as this would be incomplete without some reference to these egregious forms.

The tadpole of the plathander has been already noticed, the individualistic character of that of the *Cassina* has been referred to, whilst mention is made of the specialised development of the *Breviceps* genus and of *Arthroleptella lightfooti* in the chapters devoted to these species. Not only is the subject of this chapter a frog of a form that makes it readily distinguishable from every other local batrachian, but its tadpole possesses a characteristic to be found in no other genus in the world.

Tadpole of *H. rossei* X2.

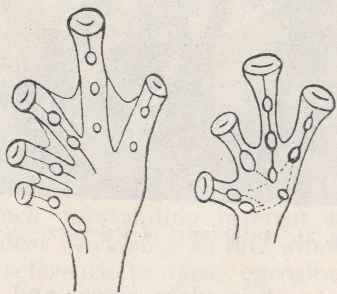
Careful examination of certain of the Table Mountain streams will at times result in the discovery of a peculiar-looking tadpole, whose flattened head and wedge-shaped outline are shown in the sketch. Their colour will vary somewhat, with that of the stream-bed, from dull greenish to amber. The remarkable feature about them is the peculiar suction arrangement around the mouth by which they are enabled to cling tightly to the rocks in the rapid streams they inhabit. If disturbed they do not swim far, coming to rest a few inches away, which makes their capture easy when once one has got the knack.

Fig. 34. Development of *Helicophrynus rossei*.

Place one in a clear glass vessel and note how it at once adheres to the side, enabling the wonderful structure of the mouth to be seen to advantage; also the manner in which the creature uses this as a walking organ, as it does when browsing slowly over the slime-covered rocks. If you have a suitable aquarium — and it must be well aerated — you may bring some home, and not only study their interesting mode of progression, but also their metamorphosis into complete frogs (Fig. 34).

Fig. 35. The Ghost Frog (*Helicophrynus rossei*).

The unusual shape of the adult frog, which is known to scientists as *Heleophryne rosei*,* is shown in the picture (Fig. 35); the flat head, the large dark eye with its vertical pupil suggesting a nocturnal habit, and especially the expanded ends of the toes, being identifiable characteristics.



Left hind and fore feet of *H. rosei*.
Nat. size.

A fully-grown female measures $2\frac{1}{2}$ inches (60 mm.) body length and over $6\frac{1}{2}$ ins. (165 mm.) from the nose to the tip of the outstretched hind toe; the male being smaller by one-third. The colour is a dull greenish with an indeterminate reddish network, and the smooth whitish skin of the under-surface is thin enough to permit the colour of the abdominal viscera to show (Fig. 36).

It is interesting to compare the skeleton of this frog (Fig. 37) with that of the Plathander (Fig. 1), and note



Left eye of
H. rosei X2.

the greater slenderness of the hind limbs. Note also how the expanded tips of the digits are supported by the T-shaped bones inside them, and also the vestige of a thumb.

Perhaps in part on account of its extremely secretive habits, *Heleophryne rosei* may be regarded as a rarity, the few adults found by us being, as far as is known the only ones ever collected. For this reason this interesting batrachian has so far been referred to by Cape naturalists as "Rose's Frog," but we wish to disclaim any proprietary right, and suggest that as its main haunt (and type locality) is Skeleton Gorge, it may

fittingly be called the "Ghost Frog," a name well in keeping with its rather weird appearance.

Although its build rather suggests an arboreal life, we have found that specimens kept in a vivarium made no attempt to perch on the branches provided, but preferred either to lie under a stone in their tank completely submerged, or to crouch in a hole in the soil. Although we tried them with insects of various kinds, we could not induce them to eat at all. It was noticed that when



Fig. 36. Stomach of Ghost Frog.

sloughing the outer skin was allowed to float away piecemeal, the frog making no effort to hasten the process. This may be a further indication of a somewhat aquatic life.*

This frog will not live well in captivity, and except for scientific study its collection is not advised.

Naturalists in other mountainous parts of South Africa should make careful note of any occurrence of frogs or tadpoles similar to those we have described, as doubtless this genus will be found to have a wide range and to show many interesting local variations. Already in the



Fig. 37. X-Ray of Ghost Frog.

Worcester district *H. purcelli*, in Knysna *H. regis*, and in Natal *H. natalensis* are known; whilst still more recently in the Northern Transvaal another member of the genus *H. sylvestris* has been identified.

One day we captured three *H. purcelli* at the foot of a waterfall near Groot Drakenstein, and many tadpoles in the same place, and on other occasions, tadpoles in the Witte Rivier and several other smaller streams in the Paarl-Worcester district. As can be seen by the photographs (Figs. 38 and 39), the shape of this frog is quite different to that of the species found on Table Mountain. The colour of the upper parts is dark green with a few large irregular reddish spots, also the skin of the belly



Fig. 38. *Helicophryne purcelli*.



Fig. 39. Stomach of *H. purcelli*.

is thick and granular and the bony thumb — shown in the X-Ray of *H. rosei* — is absent.

The granular skin of the ventral surface suggests an arboreal life and we certainly found that the three we kept in our vivarium, though spending the first few days under water, afterwards passed most of their time perched on a branch and fed readily on flies, sometimes leaping to catch them, but alighting somewhat clumsily.

The tadpole also differs somewhat in shape from that of *H. rosei* and its stomach is white. The colour of the back is as a rule a clear amber with numerous black spots.

Fig. 40 shows two tadpoles of *H. rosei* and one of *H. purcelli*.

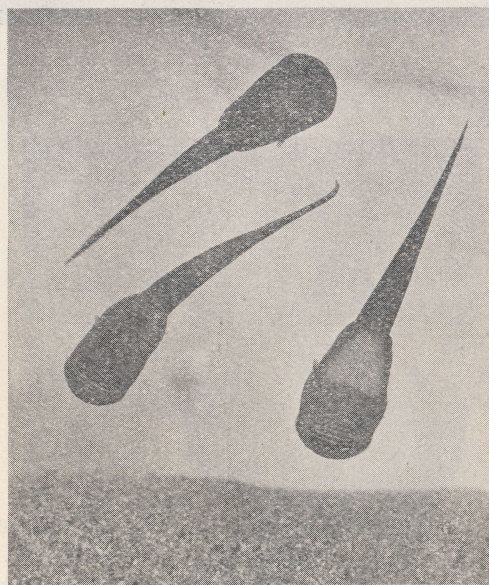


Fig. 40. Tadpoles, one *H. purcelli*, two *H. rosei*.

CHAPTER TWELVE.

SOME TOADS.

The word toad is often used as a term of abuse, as implying something exceptionally mean and contemptible, and the inoffensive animal, its very name meaning "death," has for ages been regarded by most people with an intense horror and loathing. Even Shakespeare terms it "ugly and venomous," and makes it an important ingredient in the witches' horrific cauldron.



Left Eye of
Sand Toad
X2.



Left eye of
Leopard Toad.
Nat. size.

But is he ugly? It has been said that the light of the body is the eye, and Bufo has two of the most beautiful eyes to be found in the whole animal world, well termed by the same poet, "a precious jewel in its head."

To quote again: "Handsome is as handsome does," and an animal that spends the night watches in a diligent and unremitting consumption of insects, largely injurious to human interests, need not be too severely censured for having a warty skin and bow-legs; which latter, in the case of that artificial monstrosity, the modern bull-frog, would be styled "Just too sweet for anything, my dear."

A Quatrain that we have not as yet found in any edition of Omar Khayyam's famous Rubaiyat, runs:—

A woman found a toad beneath a stone
And shrieked "Thou art the ugliest beast I've known."
Bufo replied "I am as God designed.
My complexion? True, a poor thing, yet mine own."

How often in our conception does the imagined danger of hurt or contamination outweigh the real. The anxious mother, who cries out with horror should her child grasp a harmless toad, looks on contentedly whilst he cuddles a cat that has just come from devouring a 'high' fish-

head on the refuse-heap, or has his face licked by a dog fresh from canine endearments with its kind in the street.

In the Peninsula we have three toads. The commonest is the Sand Toad or *Bufo angusticeps* (Fig. 41), the second word meaning "narrow head." It may be seen in great numbers on the sandy parts of the Peninsula during the damper weather.

The length of the body is about two inches; a large female may exceed this by half an inch or more.

The usual colour is variations of grey and brown, but it may vary from a very pale grey to practically black,



Fig. 41. Sand Toad (*Bufo angusticeps*).

according as the toad is found on sand or on dark soil. A pale vertebral stripe is occasionally present. The under surface of the body is white, of the hind limbs usually yellow. The throat of the male is not darker than that of the female. The peculiar shape of the pupil of the eye is shown by the small sketch on page 59.

These toads are moderate swimmers, they hop or run when alarmed, but the usual gait is a walk. The principal diet is insects and small snails, which are swallowed, and possibly digested, shell and all.

In general appearance, habitat and habits, the Sand Toad reminds us very much of the English "Natterjack" (*Bufo calamita*).

The 'call' is "Gaa, gaa, gaa" slowly with no appreciable dilatation of the throat.



Eggs of Sand Toad
Nat. size.

The eggs, 600 to 900 in number, are laid in long strings in small pools during June and July. The small black tadpoles develop rapidly and in the orthodox manner, the young toads, $\frac{2}{3}$ of an inch in length, being complete at the end of August.

The small pools seen in Fig. 27, Chapter 8, are favourite resorts of the Sand Toad at breeding times, and are typical of the spawning sites they favour.

Bufo angusticeps has the distinction of being in our opinion the most difficult of all the subjects in this book to photograph. Oh yes, he will sit still all right, but never in the proper position; and the dogged persistence



Fig. 42. Leopard Toad (*Bufo regularis*) Peninsula type.

with which he absolutely refuses to "stay put," but interminably pivots a petulant quarter circle away, is distinctly amusing, — to an onlooker.

Found in similar localities, but with a predilection for grassy spots and gardens, is the large Leopard Toad (*Bufo regularis*) Fig. 42. He is a fine, handsome chap,

four to five inches in length, with a brilliant yellow network on the upper surface, the ground-colour being greenish-brown or at times a vivid wine-colour. The stomach is a dirty white, the throat of the male being darker.

The Leopard Toad as found on the Cape Peninsula, is larger and much more brilliantly coloured than are his kindred in other parts of the Union; in fact when we first came across some of the latter near Paarl, 40 miles away, we supposed them to be of a different species.



Fig. 43. Leopard Toad, Paarl type.

The largest of these was just over three inches (82 mm.) long. Their colour was a dirty brown, practically no trace of pattern being discernible on the older specimens, and little more on the juveniles, also the warts were much larger (Fig. 43). A pair was found in January depositing long strings of eggs in the rapid Berg River, the strings being allowed to drift downstream amongst the stones, no effort being made to entangle them in weeds.

On the Cape Peninsula the egg-strings are laid in shallow vleis — not small puddles — in August or earlier, and are entwined with the aquatic vegetation. On one occasion we collected a mating pair, egg strings, weeds and all. The parents were the full adult size, the male being four inches (98 mm.) long, and the female five and a half inches (137 mm.). The services of the whole family were requisitioned in counting the eggs, and somewhat later the total was announced as 24,476. A suggestion that they should be counted again to make sure, was not received with any display of enthusiasm. The tadpoles do not attain any great size and the little toadlets, that are complete in December, are only half-an-inch (12 mm.) long.

The mortality must be extremely high, as in spite of this prolificness the Leopard Toad is by no means common, only one being seen to every fifty or so Sand Toads. Probably this mortality is due in the main to the fact that the tadpoles pass their lives in the shallow vleis at a period when other aquatic life is in full vigour, and are preyed on by hordes of crabs, water beetles and their larvae, and dragon fly larvae; as well as by Plathanders, terrapins and various birds, practically all of which dangers the progeny of the Sand Toad escapes.

Perhaps also the cannibalistic habits of the adults have a further thinning-out effect after the metamorphosis is complete. Not only will the large ones devour the tiny toadlets, but well-grown juniors up to at least half their own length, in addition to other toads and frogs of similar size.

When taking this larger prey the Leopard Toad stands right over it and strikes down with gaping mouth and without any apparent use of the sticky tongue.

We once had a signal proof of this propensity given us by a large specimen, whom, from his resemblance — perhaps to some extent imagined — to a certain Irishman of our acquaintance, we called McFadden.

Waiting his turn to be photographed, he was left in the same waiting-room, a paraffin box, with another subject, a six-inch lizard (*Mabuia trivittata*). Some minutes later McFadden was revealed seated alone in the box, his innocent look, which surely declared "No boss, I have not seen your little lizard" being somewhat marred by the projection of a couple of inches of tail from his mouth. Realising his error Mac hurriedly drew his hand across his mouth, and, with a convulsive gulp withdrew



Fig. 44. The Crime.

the evidence; but not before the camera had secured a record of the crime (Fig. 44).

The Leopard Toad's favourite gait is a walk, never a run; but if in a hurry he can take a surprisingly long jump. Though he does not spend much of his time in the water, he can swim quite well.

The vocal call is a harsh "Waaak, waaak," the vocal sac being distended to the size of a walnut.

All toads periodically slough or get rid of the outer layer of epidermis. This operation can be seen to the greatest advantage in the Leopard Toad. For some time he will have been looking rather dingy, his usual brilliant livery being very dull and off colour. Then one day we see him, stretching and arching his back, standing as it were on tip-toe and going through other contortions. "Whatever is the matter with MacFadden"? we say, with other expressions of anxiety. Then suddenly his soiled jacket splits up the centre of the back, and a glimpse is caught of the bright clean colouring beneath.

The rest follows quickly: with more contortions and scrapings with his hind limbs, Mac gradually divests himself completely of his outer garb, which he pushes into his mouth and eventually swallows. Whatever be his other faults, he certainly cannot be accused of leaving his clothes about the room. And now, with shiny skin

and brilliant markings, he is indeed the very epitome of resplendent toadhood. Perhaps he may even be, as he undoubtedly considers himself, the most handsome toad in the world.

It is when he is arrayed in this new suit that we notice most clearly the large glandular swellings behind his eyes, as these will in all probability be a conspicuous brick-red, the skin above the eyes and nose being similarly coloured. These glands, known as the parotoid glands, are covered with minute holes from which — should the toad be badly frightened or irritated — a creamy-white fluid exudes. This is an acrid irritant poison, quite distasteful enough to cause a dog or other carnivore to consider that a toad is a good thing to leave alone. A very small quantity of this excretion placed on a frog's skin will kill the animal in a few minutes. The smaller glands that cover all the back (the warts), also secrete an irritant poison, but not to the same extent as the parotoid glands.

By the way, the popular superstition that by handling a toad you may acquire his warts, has no foundation; you would be just as liable to acquire his bandy legs.

While you are examining the picture that shows these glands, notice just below the front end a small circular mark. This is a toad's tympanum or ear-drum; although he has no projecting ear like we have, to catch sound waves, his hearing is quite good.

As far as we have been able to ascertain, the Sand Toad appears to be rather localised, occurring in the coastal regions of Cape Province and Natal.

The Leopard Toad on the other hand, has an extremely wide range over nearly all South and Tropical Africa, and is said to occur as far north as Egypt.

Probably a complete range of data will result in the establishment of several separate species or at least sub-species.

Specimens we have seen from Rhodesia differed somewhat from the type usually seen in Cape Province, and as we have stated, the Cape Peninsula type shows marked differences in appearance and habits from those occurring on the nearest part of the mainland. Apart from the usual differences of climate, altitude and food supply, it seems to us that the fact that in some districts toads and frogs (in the case of frogs we have in mind *Rana fuscigula*) will alternately breed and aestivate, whilst in



Fig. 45. *Bufo gariepensis*.

other parts members of the same recognised species alternately hibernate and breed, is well calculated to bring about some changes of form.

In some parts of South Africa, notably the Karoo and Namaqualand, the place of the Leopard Toad is taken by the Karoo Toad (*Bufo gariepensis*), which can be distinguished by the fact that the belly is much smoother, and at times, especially in the case of juveniles, is covered with irregular dark spots; also by the first finger being shorter than the second, whereas in the Leopard Toad it is longer. We have noticed also that the shape of the pupil of the eye, in living specimens, resembles that of the Sand Toad. The photograph (Fig. 45) shows the general appearance of this toad, but the size is larger than the illustration suggests; the body length being about 3 inches (75 mm.). It has been stated that the Karoo Toad always runs instead of hopping.

CHAPTER THIRTEEN.

SOME MORE TOADS.

The third species of Cape Peninsula toad, the Striped Mountain Toad (*Bufo rosei*), is not only the smallest of the group, but, as its specific name suggests, of particular personal interest to ourselves.

A singularly aloof little chap he is too. Not for him the sandy hollows of the Flats or a retreat beneath the water-tub in a suburban garden, but a remote and adventurous life on the higher mountain slopes and plateaux.

It was on one of our Sunday outings (Feb., 1925), that roaming the mountains above Kalk Bay, we came on a small patch of marshy ground that seemed to form a very desirable haunt for 'paddas.' And so it proved! Specimens of all the three local *Ranae* were at once apparent, whilst a closer search resulted in the discovery of a number of Chirping Frogs (*Arthroleptella*) and, better still, of a few diminutive toads of unfamiliar appearance.

"Another new species, Dad"? asks one of the partners.

"Sure thing, Son, and a very interesting species too," we reply; and a good series is collected.

Compared even with the smaller of the two lowland toads, these are very tiny, the biggest found being barely 25 mm. (1 inch) in body-length, the average being about 20 mm. The colour is a very dark brown, and down the back run three light stripes, as seen in the photograph (Fig. 46), though many are so dark that the stripes are indistinguishable.

Later it is found that dark surroundings tend to induce this darkening, a bright light and background having the opposite effect and causing the stripes to become plainly visible.

The parotoid glands, situated on the side of the neck, have a distinct orange tinge.

The undersurface is a dirty brownish grey, the throat of the female being just a little lighter than that of the male.



Fig. 46. Small Striped Toad (*Bufo rosei*).

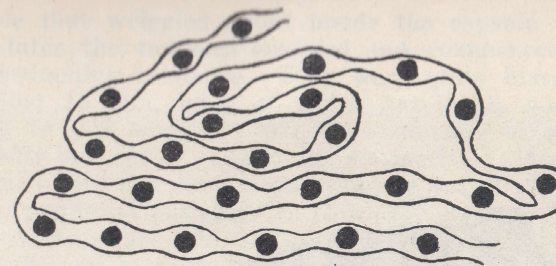
The body is very narrow in proportion to its length, and, for a toad, the neck allows the head a fair degree of lateral movement.

No tympanum (ear-drum) is visible, which suggests that the species has no vocal call, a point borne out by subsequent observation.

*Bufo rosei** seldom jumps, and then for only about an inch, but can run at a fair speed and is a moderate swimmer, though resort is only made to water at spawning-time.

On subsequent outings we came across this little toad on Muizenberg Plateau and also on the south part of the Peninsula near Jackal's Drift, but not for a long time after were we able to prove that it lived on Table Mountain or to obtain any of its spawn.

However, one cold wet day after a night of rain (Aug., 1927), in a tiny puddle more than 3,000 feet up, just below MacClear's Beacon in fact, we found a number of mating pairs and a quantity of fresh spawn. We roughly estimated that each pair was responsible for about 7,000 eggs. As if to make our find more complete, a few yards from the puddle a picnic party had left a wine bottle — needless to say quite empty — so a quantity of spawn was brought safely home for further investigation, without our having to have recourse to the less convenient "billy."



Eggs of *Bufo rosei*. Nat. size.

An illustration of this find, drawn from a 'snap' taken by a companion, appears on the title-page.

The appearance of this spawn was quite distinctive, the eggs being in a single chain, the jelly capsule joined one to the other by long narrow necks, giving the appearance of a necklace of clear black-centred glass beads.

The drawing was traced from a photograph, and shows the exact size and shape of the eggs, but when held up the chain stretched out until the nuclei were just 25 mm. (1 inch) apart.

Owing to the weather being cold, metamorphosis proceeded slowly, the nucleus gradually assuming a semi-lunar shape, developing at the 10th day into a small



Fig. 47. Development of *Bufo rosei*.

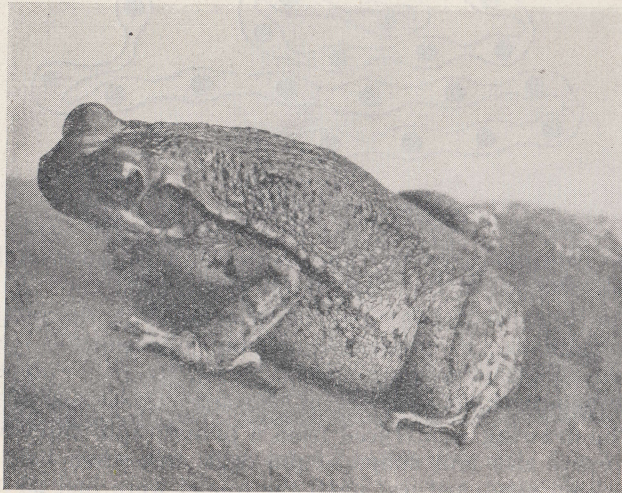


Fig. 48. The Red Toad (*Bufo carens*).



Fig. 49. *Bufo vertebralis*.

tadpole that wriggled about inside the capsule. Two days later the tadpoles emerged and commenced their free swimming existence. They were quite black then and just 15 mm. long, of which two-thirds was tail. Owing to this length of tail the swimming action was decidedly serpentine, and quite distinctive. An exact account of the metamorphosis would be out of place here and is published elsewhere.* However, about six weeks after the eggs are laid, the little toads (Fig. 47), each about the size of a grain of wheat, are ready to wander forth on to the mountain side; some to attain to full mature 30 mm. toadhood, the majority, we fear, to succumb untimely to the manifold dangers that will beset them.

It is of interest to note that the toads collected on Table Mountain were considerably larger than their cousins of Muizenberg and Jackal's Drift, the average size being 30 mm., the largest measuring just 35 mm.

So far the above is all that is known about the haunts of the Striped Mountain Toad, or Rose's Toad as it is sometimes more briefly called, but it is probable that naturalists in other parts of South Africa will find that this, or some nearly related species, has a wide range at a few thousand feet above sea-level.

* * * * *

In addition to the four toads to which we have already referred, we should mention the Red Toad (*Bufo carens*), which is found in Natal, Transvaal, Rhodesia and Mozambique, being in some localities extremely abundant. This species (Fig. 48) is distinguished by the absence of the large glands (parotoid) behind the eye, a characteristic that is shared by *Bufo vertebralis* (Fig. 49), a much smaller species with a speckled stomach, that is found in the Northern Cape Province and the Orange Free State. It is of interest to note that this toad has been known to complete its metamorphosis from egg to complete tail-less toad in 16 days,* which may secure for South Africa the world's Bufonid speed record.

Four or five other South African species, having more limited range are known.

We need hardly say that no naturalist believes that toads are able to remain for centuries entombed in solid rock, though the idea is still widely prevalent.

CHAPTER FOURTEEN.

THE BULL FROG.

We have only had one Bull-Frog, which was sent to us by a friend in Bulawayo. He was a fine chap with a body seven inches long, and so fat and heavy that it was difficult to realise that he entered the world as a black speck 2 millimetres in diameter, contained in a clear blob of jelly just twice that width.

In colour he was dark green above and a bright yellow below. Being too big for any vivarium a corner of the garden was fenced off for him and a large tin was sunk in the ground for his bath.

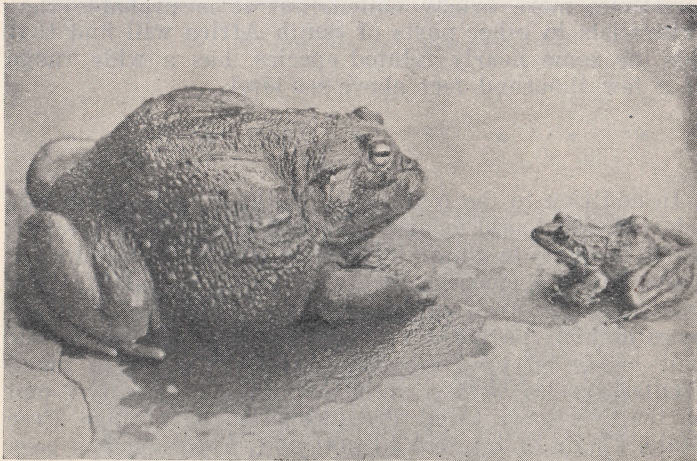


Fig. 50. Bull Frog compared with Marbled Throat Frog.

In this bath he would lie completely submerged for hour after hour, coming to the surface at intervals for a breath of fresh air. At other times he would dig himself in by shuffling backwards into the soil with his hind feet, and would remain buried to the tip of his nose apparently sound asleep. If disturbed he would give vent to a discontented grumble "W-a-a-a-a-gh," which, by scratching his back, could be raised to an angry

crescendo "Qu-a-a-a-a-k" with a bouncing jump of his inflated body to a quieter spot.

When thus giving open-mouthed vent to his disapproval, he showed in the lower jaw — in about the position occupied by a dog's long 'canine' teeth — two large tooth-like projections that normally fitted into recesses in the upper jaw, and which, though covered by skin, were sufficiently sharp to make a bite from the powerful jaws a thing to be avoided.

But on what were we to feed him? His movements had of necessity to be restricted, and we certainly had no

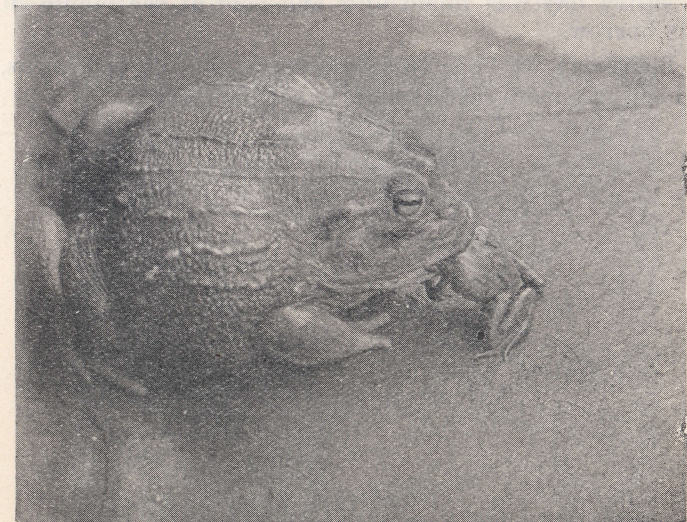


Fig. 51. Bartholomew helps himself.

time to procure the quantity of worms and insects that such a large body would require. Bartholomew, as we called him, solved the problem for himself, and probably at the same time indicated what was his favourite diet and the use of his formidable lower 'teeth.' We had just secured his likeness vis-a-vis with a large *R. fuscigula* (Fig. 50) when Bartholomew suddenly lunged forward on to the unsuspecting frog, who was half engulfed before he realised what it was all about.

The camera being in position, it was only necessary to make a hurried adjustment of the focus, slip in a fresh slide, and make the exposure to secure what is possibly a unique photograph (Fig. 51).

Anyhow the problem of diet was solved, and Bartholomew was provided with two frogs a week and thrived exceedingly thereon. Later we accustomed him to take dead food by agitating it in front of him with a long twig into as frog-like movements as we could contrive.

Bull-frogs are accustomed to retire underground during the cold weather, and at the first winter chill Bartholomew duly betook himself below. However the Peninsula winter, with its delightful interlarding of warm summery days, seemed to perplex him completely. After several retirements and premature emergences on a false promise of the advent of spring, Bartholomew gave up the unequal struggle; and one cold night following a sultry day was found stiff and cold at the mouth of his burrow.

Some day we hope to secure some juvenile specimens, which may more readily become acclimatised.

CHAPTER FIFTEEN.

SOME UNUSUAL BREEDING HABITS.

Although all our collecting and observations have of necessity been carried on in the vicinity of Cape Town, now and again through the kindness of a friend, we have been enabled to secure an interesting living specimen from farther afield, as in the case of the Bull Frog.

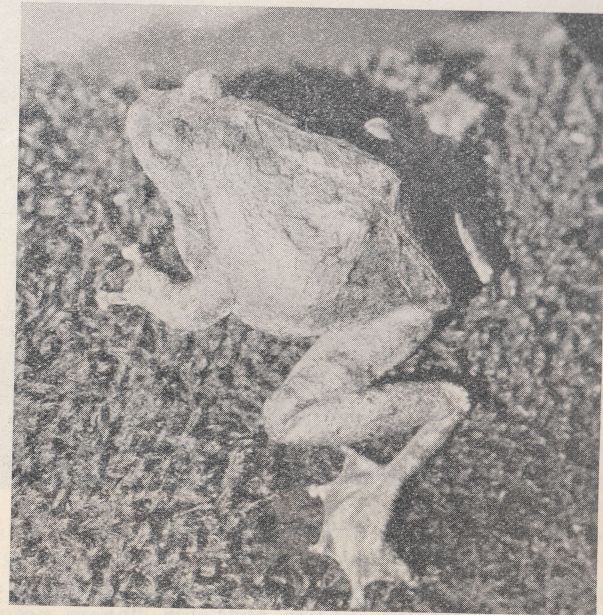


Fig. 52. Large Grey Tree Frog (*Chiromantis xerampelina*).

What is perhaps the most interesting of these acquisitions forms the inspiration and principal subject of this chapter.

The Large Gray Tree Frog (*Chiromantis xerampelina*) hails from the Northern Transvaal, Rhodesia and Zululand. Our specimen, from near Bulawayo, is a well-grown one, a fraction less than 3 ins. in body-length, the hind leg being another four inches long. Above it is smooth

and of a hue which varies from dark grey to nearly white, with slight markings as shown in the photo (Fig. 52), and is thinly sprinkled with a few small brown skin-glands. The skin of its belly is white and granular, and it — probably he — has a dark throat. The toes are about three-fourths webbed and the tips of all the digits are expanded into discs similar to those of the Ghost Frog (*Heleophryne*), though the two frogs belong to quite distinct families.

Let us put our *Chiromantis* on a tree. We notice that he prefers a horizontal to a vertical branch, his gripping powers in proportion to his weight being by no means

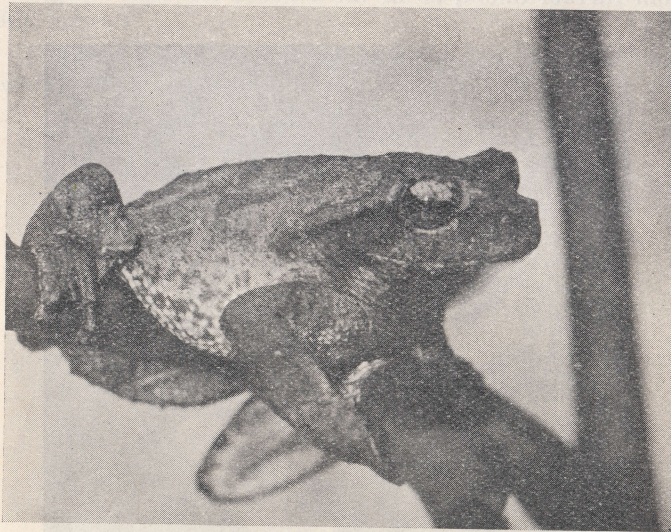


Fig. 53. *Chiromantis* on branch.

comparable to those of the slimy built Arum Frogs. As he crouches there, we notice that his fingers actually clutch the branch, the digits having the power — unusual in batrachia—of being opposable, and sometimes he even embraces his perch with his forelimbs (Fig. 53). In this habit he differs completely from the Arum Frog which does not grip even the thinnest grass stalk, but relies entirely on the adhesive properties of its digits (see Fig. 17). He is capable of a moderate leap, but gives us the idea that he would have to be very sure of his landing-place before he essayed the jump. Placed in water he swims with slow powerful strokes of the long hind-legs, the arms being held close to the sides, but does not seem particular-

ly happy in this element and crawls out at the first opportunity. Perhaps our Steenbras water is too cold for him.

But the most interesting detail is yet to be told. Our intention was to include in this book only such details as we have been able to observe personally, but we shall break this rule in order to describe the breeding-habit of *Chiromantis*, for which we shall draw on the accounts of several observers for a complete narrative of this most interesting procedure.

In our brief survey of the South African *Anura*, we have come across frogs that follow the usual batrachian habit by depositing their eggs in pools or streams, frogs that lay their eggs in mud-hollows or grass-tufts near the water's edge, frogs that choose a clump of damp moss as a nursery, and frogs whose progeny is reared in an underground chamber. *Chiromantis* chooses still another and most remarkable situation by making a nest for its eggs in a tree.

"In June or July the females lay transparent unpigmented eggs in a mass of beaten foam attached to leaves or twigs, usually in bushes not far from the ground. The foam is made from a mucous-like fluid deposited by the female at the same time as the eggs, and beaten to a froth by the hind-legs of the male and female frogs working together. The whipping-up of the froth takes a considerable time, and thoroughly aerates the egg-mass.

This is always above a waterhole, whence the frog obtains water to keep the foam moist by squirting some thereon at intervals.

The masses are as large as cocoanuts, and if opened will be found to contain thousands of cream-coloured eggs or tadpoles moving about in a froth that resembles the spume one sees at times on the sea-shore.*

These larvae develop very rapidly, and, provided with external gills and a well developed tail, swim about in the froth of the egg-mass. In the natural course of events the tadpoles are probably washed down into the water by rain or wriggle thither, but it is possible that in some cases the young frog may complete its metamorphosis in the nest.

The mother appears to take considerable interest in her brood, and has been observed sitting on her nest and clasping it with her four limbs. If the frog is killed or the water dries up, the ball becomes hard on the outside like glue, and after a time the contents perish. The nest is then occupied by a large fly apparently attracted by

the smell of the dead tadpoles, and many people seeing the flies issuing from the ball assume that it has been constructed by them."

* * * * *

Whilst on the subject of unusual breeding habits of frogs, we will briefly mention a few other interesting departures from the usual procedure.

Ratray's Frog (*Anhydropfryne ratrayi*) found in the Amatola Mountains, lays about 20 eggs in a small underground chamber, the whole metamorphosis taking place within the chamber, the tadpoles drowning if placed in water.

Boneberg's Frog (*Natalabatrachus bonebergii*), a Natal species, attaches clusters of spawn to exposed rocks from 2-6 feet above the surface of the water or to branches of overhanging trees, the larvae eventually wriggling or being washed by rains into the water. Another Natal species (*Megalicalus spinifrons*), also lays its eggs on leaves of trees overhanging water.

Some burrowing frogs with curious pig-like snouts (called for this reason *Hemisus*) are found in Northern Transvaal, Angola, Rhodesia, and Natal. Of these "the eggs are laid in small cavities under the surface of the bank of a pool and are looked after by the female until they are hatched. The female then digs a tunnel from the nest to the water, down which the tadpoles wriggle in a mass. The young tadpoles have a peculiar method of respiration, and are able to remain alive out of water for as much as 18 days."*

* * * * *

Of species living in other parts of the world, many have highly original breeding habits, concerning some of which the following brief details are culled from Gadow's splendid volume on Amphibia in the Cambridge Natural History series.

Surinam Frogs when pairing spread the eggs over the back of the female, where they become enclosed by a special growth of the skin, the young developing each in a separate little cubicle.

In the Midwife Frog, a European species, the convoluted mass of eggs becomes attached to the hind legs of the male, who then retires to an underground chamber from which he emerges at night to moisten the eggs and

to feed. After about three weeks the dutiful parent conveys his burden to the nearest water.

The female of a Ceylon species attaches her twenty eggs to the under-surface of her belly; whilst the male of an American frog carries the eggs about in his vocal sac from which the young frogs emerge fully formed.

A South American frog, though she deposits her eggs in a shallow pool, protects them by a carefully constructed circular wall of mud 4 inches or more in height.

* * * * *

The above, touching as it does only the fringe of the subject, may demonstrate what a fund of interest there is even in such lowly creatures as frogs, and may encourage young South African naturalists more fully to explore this comparatively neglected field of study in our own country.